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World J Surg (2011) 35:2399–2402
DOI 10.1007/s00268-011-1249-6

Components Separation Technique Combined with a Double-Mesh Repair for Large Midline Incisional Hernia Repair

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Published online: 1 September 2011
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Abstract
Background The surgical treatment of large midline incisional hernias remains a challenge. The aim of this report is to present the results of a new technique for large midline incisional hernia repair which combines the components-separation technique with a double-prosthetic-mesh repair.
Methods The records of all consecutive patients who received a double-mesh combined with the components-separation technique for ventral hernia repair were reviewed. The clinical, surgical, and follow-up data were analyzed.
Results Nine patients [3 women, 6 men; median age = 62 years (range = 26–77)] were included in the study. Median transverse defect size was 20 cm (range = 15–25). The median duration of hospital stay was 8 days (range = 5–17). Postoperative complications occurred in 66% (6/9). Follow-up [median = 13 months (range = 3–49)] showed no recurrent hernias, but one patient had a small hernia after a relaparotomy for colon carcinoma recurrence. The overall occurrence of wound infections was 44% (4/9). There was no mortality.
Conclusion The components-separation technique in combination with a double-mesh has shown a low recurrence rate in the short-term follow-up. However, there is a considerable occurrence of postoperative wound infections. Long-term results of the hernia recurrence rate have to be awaited.

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Introduction

Current knowledge suggests that in terms of recurrence, the optimal treatment for small- to medium-sized ventral hernias is mesh repair [1, 2]. If the defect is too large for mesh repair, the components-separation technique should be used. The components-separation technique, with the use of autologous tissue and its variations, has been described by Albanese in 1951 [3] and Ramirez in 1990 [4]. With this technique it is possible to advance the retracted rectus abdominus muscle 6–7 cm toward the midline on each side. The main disadvantage of the components-separation technique, however, is the relatively high recurrence rate of 18–30% [5–7]. Moreover, there is the possibility of a lateral blowout, in which a hernia recurs at the site where the external oblique muscle is separated from the lateral border of the rectus muscle.

In theory, the recurrence rate of the components-separation technique should be improved by a combination with mesh. Improved results indeed have been shown by two studies from Ho et al. [6, 8]. Use of double-mesh alone for ventral hernia repair has also been described in a case report [9] and in a consecutive patient cohort, showing promising results [10]. However, in these cases, combining the two techniques might be even more favorable, especially when using a double-mesh. By doubling the mesh, with the second layer fixed as an onlay to the loose and retracted external oblique muscle, the recurrence rate theoretically should be improved.

This combined technique with double-mesh has not yet been described in the literature. The aim of this report is to

present the results of a new technique for large midline incisional hernia repair that combines the separation-of-components technique with a double-prosthetic-mesh repair.

Patients and methods

Between 2006 and 2010, the medical records of all consecutive patients who received a double-mesh combined with the components-separation technique for ventral hernia repair were reviewed. The data was retrieved from the hospital records. The clinical, surgical, and follow-up data were analyzed. The abdominal wall defect was measured based on a CT scan before surgery. Patient characteristics and medical history were recorded. Postoperative complications were defined as any complication within 30 days.

Demographic and perioperative data of the patients are presented in Table 1. Between January 2006 and December 2010, a total of nine patients underwent the combination procedure. The group consisted of three women and six men with a median age of 60 years (SD ± 16). Mean size of the transverse defect was 20 cm (SD 3). The exact sizes of the defects are presented in Table 2. Five patients were operated on primarily for a colon malignancy. One of these patients had undergone an abdominal repair of an aortic aneurysm before. Two patients were active smokers and one patient had a history of alcohol abuse and chronic pancreatitis.

Table 1 Demographic data of the patients

Demographic and perioperative data	No. of patients ($n = 9$)
Median age (years)	62 (range = 26–77)
Gender (male/female)	3/6
Median body mass index (kg/m^2)	27 (range = 24–31)
Medical history	
Abdominal aneurysm repair	2
Colon malignancy	5
Abdominal trauma	1
Perforation/diverticulitis	2
COPD	2
Prior laparotomies	2 (range = 1–4)
Prior attempts for hernia repair	
1 attempt	3
>2 attempts	0
Median defect size (cm^2)	352 (range = 75–500)
Transverse defect size (cm)	20 (range = 15–25)
Horizontal defect size (cm)	16 (range = 6–25)
Median operative time (min)	180 (range = 135–540)
Median hospital stay (days)	8 (range = 5–17)

Table 2 Preoperative defect widths on CT scan

Patient	Defect widths (cm)	Surface area (cm^2)	Meshes
1	5 × 15	75	Double vypro meshes
2	16 × 22	352	Double vypro meshes
3	11 × 19	209	Parietex compositum and vypro mesh
4	14 × 24	336	Parietex compositum and vypro mesh
5	20 × 20	400	Parietex compositum and vypro mesh
6	25 × 20	500	Parietex compositum and vypro mesh
7	25 × 20	500	Double vypro meshes
8	18 × 25	450	Double vypro meshes
9	6 × 20	120	Double vypro meshes

Components-separation technique is major surgery; therefore, the preoperative condition of the patients was optimized by advising the patients to lose weight, stop smoking, and consult with a lung specialist. According to hospital protocol, all patients received intravenous antibiotics 30 min prior to surgery. All patients received general anesthesia and epidural anesthesia for pain management.

The operative procedure consisted of the following steps: (1) The skin and subcutaneous fat were dissected from the fascial layer. After this, the aponeurosis of the external oblique muscle was cut from the rectus abdominus muscle. The transection was performed 1.5–2 cm laterally from the lateral border of the rectus abdominus muscle sheet. (2) After the dissection of the aponeurosis, the rectus abdominus muscle could be medialized 6–7 cm on both sides. The remaining defect in the midline was closed using a Vypro mesh (Ethicon, Johnson & Johnson, Somerville, NJ). Vypro is a light-weight mesh consisting of a monofilament polypropylene and Vicryl. This mesh was placed preperitoneal and attached bilaterally to the rectus muscle with a 3-cm overlap of the border of the freed oblique muscle. In four patients it was not possible to close the peritoneal sac so intraperitoneal Parietex (Covidien, Dublin, Ireland) was used instead of Vypro. Parietex is a mesh with a collagen barrier on one side to limit visceral attachments and a polyester structure on the other side. (3) The mesh was attached to the abdominal wall with a nonresorbable continuing monofilament suture (Prolene, Ethicon). (4) On top of the Vypro or Parietex mesh, Vypro mesh was placed as an onlay to cover the previous repair and was fixed to the laterally retracted transected aponeurosis of the obliquus externus muscle with nonresorbable

continuing monofilament sutures. (5) The subcutis was approximated and the skin was closed intracutaneously with a resorbable monofilament suture (Monocryl, Ethicon). (6) One or two vacuum drains were placed subcutaneously before skin closure. The drains were removed when output was less than 50 ml per day.

Results

The median duration of hospital stay was 8 days (range = 5–17). Postoperative complications occurred in 66% (6/9). Wound infection was the most frequent complication registered postoperatively (Table 2).

The follow-up [median = 13 months (range = 3–49)] showed no recurrent hernias or lateral blowouts after this procedure, except for one patient (Table 3). She had a small midline hernia after another relaparotomy for the recurrence of colon carcinoma on the anastomosis. During this procedure, 18 months after the initial hernia repair, the abdomen was closed primarily. No hernia recurred after the relaparotomy. There was no mortality. Overall, wound infection occurred in 44% (4/9). Two of these patients had a stoma (1 colostomy, 1 ileostomy). These stomas were reanastomosed simultaneously with the hernia repair. All wound infections occurred within a few days after the hernia repair. The wounds were opened superficially and managed with local care and oral antibiotics. One patient received antibiotics intravenously. This patient needed drainage and excision of necrotic skin in the operating room; after that, the wound was managed with local vacuum therapy. There was no deep infection. All wounds healed by secondary intention within 6 weeks during outpatient follow-up. All wound infections were superficial, and it was not necessary to resect or remove any part of any mesh after the infections.

Table 3 Postoperative complications

Postoperative complications	$N = 9$
Early complications ≤30 days[a]	
No. of patients with without complications	3
Wound infection	4
Seroma needing drainage	1
Pneumonia	1
Urinary tract infection	1
Paralytic ileus	2
Other	2
Late complications >30 days	
Secondary wound healing	3
Recurrence hernia[b]	1
Overall wound complications	4
Recurrence hernia[b]	1
Total number of readmissions	3
Total No. patients with one or more complications (early and late)	7

[a] Some patients had more than one complication

[b] Small hernia after relaparotomy and primary closure for colon carcinoma recurrence

Discussion

The present report describes the results of a surgical method for large ventral hernia repair that combines the separation-of-components technique with a double-prosthetic-mesh repair. The components technique was used to lower tissue tension in the wound and to achieve tension-free closure of the skin. Furthermore, it has been shown that the abdominal domain is maintained better in terms of bulging and functional perspective when mesh is applied in combination with the component-separation technique as compared to the use of mesh augmentation only [11]. The recurrence of hernias was low in our group, but the percentage of wound infections (44%) is relatively high. However, all wound infections were superficial and healed by secondary intention. Only one was treated with intravenous antibiotics.

The results of a double layer of mesh in 50 consecutive cases have been described earlier by Moreno-Egea et al. [10]. They reported no recurrences and only 2% wound infections, 4% wound dehiscence, and 10% subcutaneous seroma which needed aspiration. No other complications were reported. The patients' characteristics and defect size in our study were comparable with those of Moreno-Egea et al. [10].

Studies reporting results of the component technique without mesh show considerable wound complication rates [12] (as high as 35%) and morbidity rates [13] (18–24%). The most probable cause for the high wound infection rate in this study could be the vascular compromise of the medial edge of the skin in combination with a large wound surface. Most perforating vessels nourishing the medial skin are cut when dissecting the skin totally free from the rectus abdominis fascia. A way to overcome this problem might be to meticulously preserve two or three perforating arteries from each side coming through the rectus abdominis muscle.

Another explanation of the high wound infection rate in our study may be the simultaneous dismantling of a colostomy in one patient and an ileostomy in another. Both of these patients developed wound infections. However, a study by van Geffen et al. [11] in which all patients had contaminated wounds prior to surgery, showed a wound infection rate of 19%, which is relatively low. There was

also a high incidence of pulmonary and urinary complications, which probably reflects the extensive nature of this type of operation.

In our study, there was only one recurrent hernia in one patient and there were no lateral blowouts. However, this patient had received another laparotomy and bowel resection for the recurrence of colon carcinoma at the site of the anastomosis. Thus, this recurrence probably cannot be attributed to our procedure.

In conclusion, while awaiting results of longer follow-up, the described technique of the combination of the components-separation technique enforced with a double-mesh shows a low hernia recurrence rate. However, there is a considerable occurrence of superficial wound infections all of which could be managed with local care and oral antibiotic therapy.

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